Montana Department of Environmental Quality

Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

PERMIT FACT SHEET

MONTANA GROUND WATER POLLUTION CONTROL SYSTEM (MGWPCS)

Permittee:	Anaconda-Deer Lodge County (ADLC)
Permit Number:	MTX000231
Permit Type:	Domestic wastewater
Application Type:	Renewal
Facility Name:	Anaconda-Deer Lodge County Wastewater Holding Ponds and IP Beds Facility
Facility Location:	Section 29, T5N, R10W, Anaconda-Deer Lodge County Latitude: 46.12924°, Longitude: -112.90081°
Facility Address:	Approx. ¼ mile east of the intersection of the Galen Hwy. and Lost Creek Rd. 800 Main Street, Anaconda, MT 59711 (mailing)
Facility Contact:	Chas Ariss, PE, Public Works and Planning Director
Treatment Type:	Aerated Lagoons
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001 / Infiltration - Percolation Beds (5)
Effluent Type:	Domestic and commercial strength wastewater
Mixing Zone:	Standard
Effluent Limit Type:	WQBEL
Effluent Limits:	Total nitrogen: 219 lbs/day
Flow Rate:	Design maximum: 3.0 million gpd Design average: 2.5 million gpd
Influent / Effluent sampling:	Monthly: INF-01 (Influent sampling manhole) EFF-01 (Effluent sampling manhole)
Ground water sampling:	Monthly: MW-5, MW-6; Quarterly: MW-1B
Fact Sheet Date:	December 2018
Prepared By:	Darryl Barton

1.0 PERMIT INFORMATION

DEQ issues MGWPCS permits for a period of five years. The permit may be reissued at the end of the period, subject to reevaluation of the receiving water quality and permit limitations. This fact sheet provides the basis for DEQ's decision to renew a MGWPCS wastewater discharge permit for Anaconda-Deer Lodge County (applicant) for the Anaconda-Deer Lodge County Wastewater Holding Ponds and Infiltration / Percolation (HIP) Beds Facility.

1.1 APPLICATION

DEQ received an application for renewal of the permit on November 12, 2018. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on November 14, 2018.

1.2 PERMIT HISTORY

The original permit was issued April 1, 2014. Effluent limit for total nitrogen was set at 219 lbs/day.
All special conditions of the previous permit have been addressed:

- Installation of effluent flow meter (completed December 24, 2014)
- Report effluent flow monitoring (completed January 31, 2015 to present)
- Report of effluent flow meter installation (completed April 28, 2015)

There was one violation found during review of records: the DMR for January 31, 2015 was submitted late.

The HIP facility was constructed in 1991 prior to the groundwater rule of 1998 so it operated initially without a discharge permit. Upgrades to the facility and the extension of the sewer collection system to West Valley necessitated the issuance of a discharge permit.

1.3 CHANGES TO THIS PERMIT

There are special conditions of this permit discussed in Section 5.3. Among them are documentation of replacing the liners and aerators in the lagoons, and use of a septic pumper truck dump station. Updated ambient groundwater information was used to calculate and update effluent limit for nitrogen but there was no change in the effluent limit. Groundwater monitoring requirements for MW-5 and MW-6 have moved to monthly sampling and for MW-1B have moved to quarterly sampling.

2.0 FACILITY INFORMATION

2.1 LOCATION

The ANACONDA-DEER LODGE COUNTY wastewater system consists of three facilities.

1. Headworks and aerated lagoons are located one and a half miles east of Anaconda off MT Highway 1, a half mile west of the intersection of Galen Road and MT Highway 48 (**Figure 1 and 2**).
2. Holding ponds and IP beds (HIP) are located three miles northeast of Anaconda at the intersection of Galen Road and Lost Creek Road (**Figure 1 and 3**).
3. Irrigation facility is located five miles northeast of Anaconda at the junction of Galen Road and South Racetrack Road. (**Figure 5**)

The system serves an estimated 3,330 residential homes and 210 commercial connections from the city of Anaconda.

Figure 1. Location of the ANACONDA WASTEWATER SYSTEM

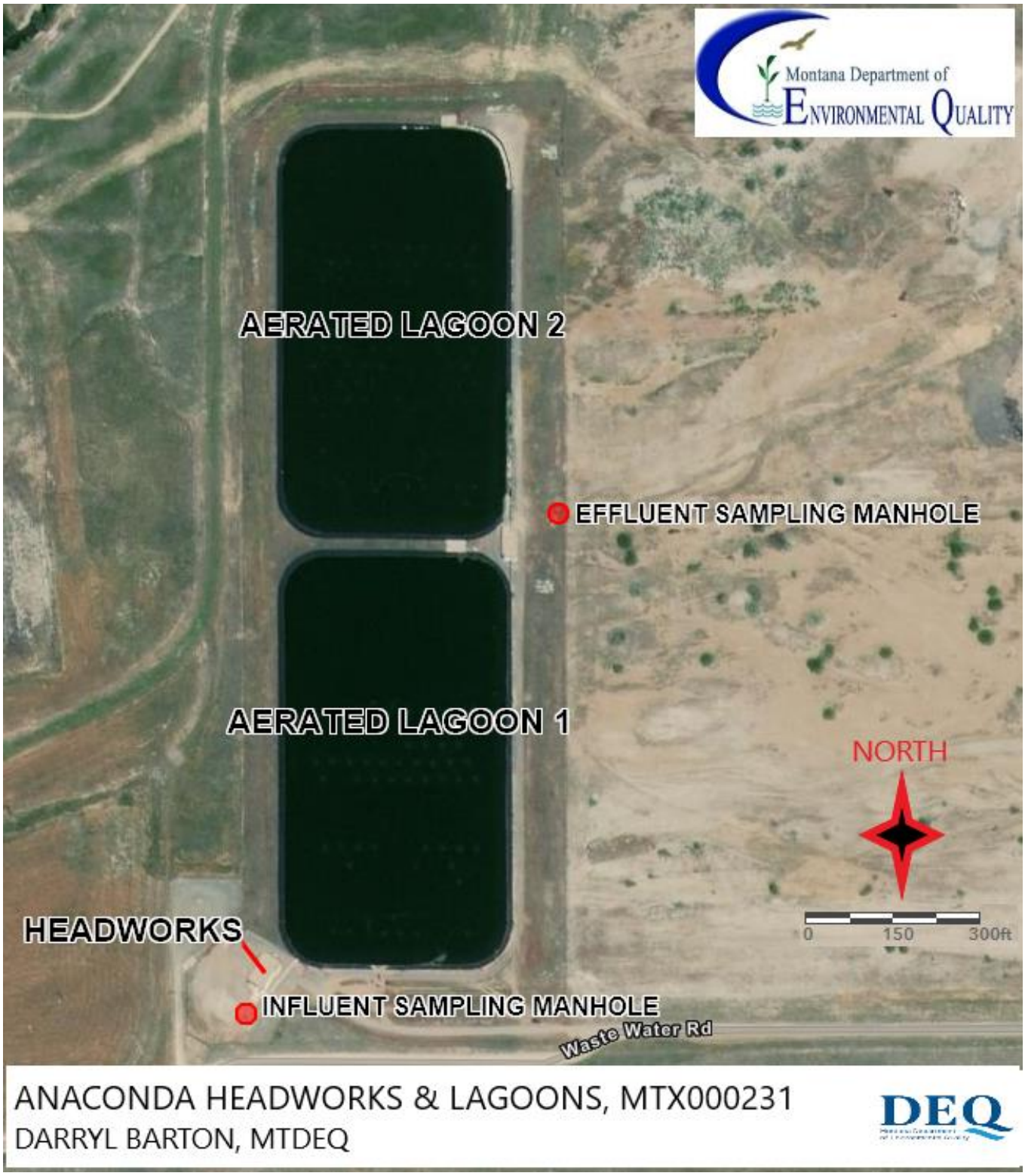


Figure 2. ANACONDA HEADWORKS & LAGOON

Figure 3. ANACONDA HOLDING PONDS & INFILTRATION BEDS

2.2 OPERATIONS

System operations are summarized below in **Table 1**.

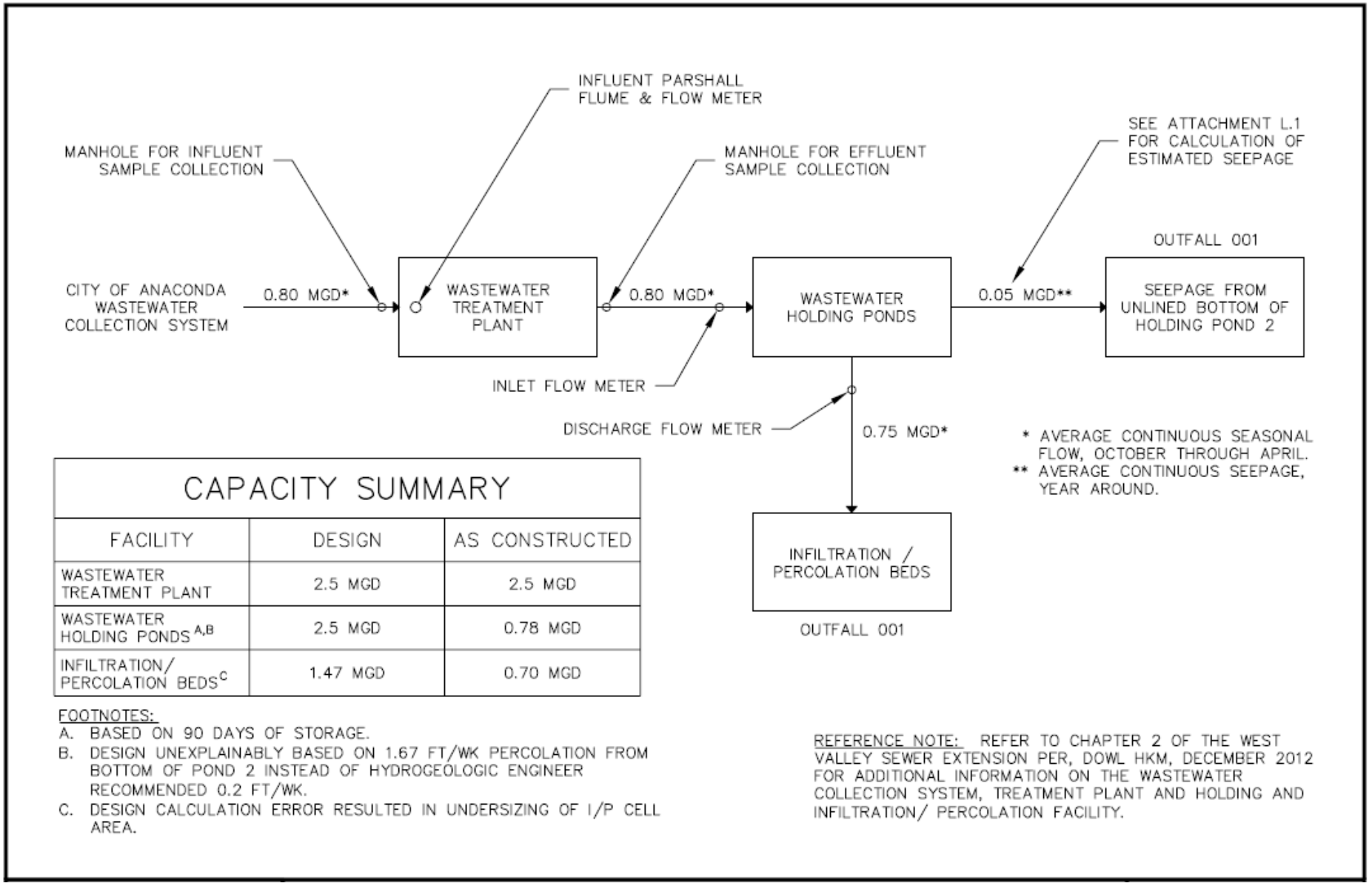
Table 1: Collection, Treatment, and Disposal System Summary
Inflows
Contributing Sources of Wastewater: Domestic and commercial sources Standard Industrial Code(s) (SIC) of contributing sources: 14952 The number of connected residences: 3,330 The number of connected business: 210
Influent Sampling Location: INF-001 Manhole prior to headworks
Influent Flow Monitoring Equipment: FM-001 Influent Flow Meter in headworks building prior to discharge to lagoons (Parshall Flume electromagnetic flow meter)
Treatment
Two partially mixed aerated lagoons followed by two holding ponds
Treatment Level: Aerated Lagoons
Location: Latitude: 46.12924°, Longitude: -112.90081°
Disposal System
Disposal Structure: Outfall 001
Method of Disposal: Two holding ponds followed by 5 infiltration / percolation beds (I/P)
Location: Section 29, T5N, R10W Latitude: 46.15806°, Longitude: -112.88083°
Average Daily Design Flow (gpd): 2.5 MGD Daily Maximum Design Flow (gpd): 3.0 MGD
Effluent Sampling Location: EFF-001: Manhole post lagoons prior to discharge to holding ponds
Flow Monitoring Equipment: FM-002: Flow meter post lagoons prior to discharge to holding ponds (Electromagnetic Badger M-series M2000 Flow Meter)

Wastewater flows into the headworks where it undergoes fine screening for debris removal. Effluent then enters two partially aerated lagoons where it is treated. Lagoon retention time is 30 – 45 days. Treated wastewater from the headworks and lagoons then flows in an 18-inch gravity pipeline to the Holding and Infiltration / Percolation (HIP) facility. It is stored in two holding ponds. The first holding pond is lined; the second has lined sides and an unlined bottom. Effluent is used for irrigation during the growing season. Outside of the growing season it is conveyed to five Infiltration / Percolation (I/P) beds where it infiltrates into the ground and is further treated by the soil before discharge into a Class I ground water.

Raw wastewater is sampled at the manhole prior to the headworks (INF-001). Treated wastewater is sampled at the manhole after the lagoons prior to discharge to the holding ponds at the HIP. Influent and effluent sampling locations are mapped in **Figure 2**. No significant deficiencies in the physical facilities were noted during a DEQ inspection of the facility conducted May 25, 2018.

Monitoring and sampling requirements are further discussed in **Section 6**.

Figure 4 is a line drawing of the collection, treatment, and disposal process.



CAPACITY SUMMARY

FACILITY	DESIGN	AS CONSTRUCTED
WASTEWATER TREATMENT PLANT	2.5 MGD	2.5 MGD
WASTEWATER HOLDING PONDS [A,B]	2.5 MGD	0.78 MGD
INFILTRATION/ PERCOLATION BEDS [C]	1.47 MGD	0.70 MGD

FOOTNOTES:

A. BASED ON 90 DAYS OF STORAGE.

B. DESIGN UNEXPLAINABLY BASED ON 1.67 FT/WK PERCOLATION FROM BOTTOM OF POND 2 INSTEAD OF HYDROGEOLOGIC ENGINEER RECOMMENDED 0.2 FT/WK.

C. DESIGN CALCULATION ERROR RESULTED IN UNDERSIZING OF I/P CELL AREA.

REFERENCE NOTE: REFER TO CHAPTER 2 OF THE WEST VALLEY SEWER EXTENSION PER, DOWL HKM, DECEMBER 2012 FOR ADDITIONAL INFORMATION ON THE WASTEWATER COLLECTION SYSTEM, TREATMENT PLANT AND HOLDING AND INFILTRATION/ PERCOLATION FACILITY.

Figure 4. Wastewater Treatment System Line Diagram. (Dowl HKM)

2.3 EFFLUENT AND INFLUENT CHARACTERISTICS

DEQ requires a permit applicant to disclose the quality of the effluent so that DEQ may evaluate the potential for pollution of state water. During the previous permit cycle, the facility sampled and reported effluent quality criteria to DEQ in the form of discharge monitoring reports (DMRs). These data are summarized below in **Table 2**. The majority of the concentrations are reported in units of milligrams per liter (mg/L), which is equivalent to one part per million.

Table 2: Effluent Characteristics

Parameter	Units	Maximum Value	Average Value	Number of Samples	Source of Data
Flow Rate	MGD	2.2	0.46	12	1
pH (minimum)	s.u.	NR	7.4	NR	1
pH (maximum)	s.u.	NR	8.1	NR	1
Total Suspended Solids (TSS)	mg/L	47	31	12	1
Biochemical Oxygen Demand (BOD_5)	mg/L	70	23	12	1
Oil & Grease	mg/L	1	1	12	1
Escherichia coli Bacteria	CFU/100 ml	NR	NR	NR	1
Ammonia, Total (as N)	mg/L	23.3	14.7	12	1
Total Kjeldahl Nitrogen (as N)	mg/L	25.4	17.1	12	1
Nitrate + Nitrite (as N)	mg/L	12	3.73	12	1
Total Phosphorus (as P)	mg/L	3.08	2.68	12	1
Specific Conductivity	µS/cm	NR	NR	NR	1
Chloride (as Cl)	mg/L	NR	NR	NR	1

Footnotes:

NR = Not Reported.

(1) Source of data: 2018 MGWPCS permit application and supplemental materials

Effluent limitation for Total Nitrogen is **219 lbs/day**. Average effluent for Total Nitrogen from 2014 – 2018 = **60.80** lbs/day. Over the past year the average effluent Total Nitrogen is **83.79 lbs/day**.

Table 3: Influent Characteristics

Parameter	Units	Maximum Value	Average Value	Number of Samples	Source of Data
Flow Rate	MGD	2.2	0.88	12	1
pH (minimum)	s.u.	NR	NR	NR	1
pH (maximum)	s.u.	NR	NR	NR	1
Total Suspended Solids (TSS)	mg/L	258	147	12	1
Biochemical Oxygen Demand (BOD_5)	mg/L	220	138	12	1
Oil & Grease	mg/L	NR	NR	NR	1
Escherichia coli Bacteria	CFU/100 ml	NR	NR	NR	1
Ammonia, Total (as N)	mg/L	NR	NR	NR	1
Total Kjeldahl Nitrogen (as N)	mg/L	39.4	30.6	12	1
Nitrate + Nitrite (as N)	mg/L	0.890	0.211	12	1
Total Phosphorus (as P)	mg/L	NR	NR	NR	1
Total Dissolved Solids	mg/L	NR	NR	NR	1
Specific Conductivity	µS/cm	NR	NR	NR	1
Chloride (as Cl)	mg/L	NR	NR	NR	1

Footnotes:

NR = Not Reported.

(1) Source of data: 2018 MGWPCS permit application and supplemental materials

In comparing the influent and effluent monitoring data there are some areas of interest. Influent flow upstream of the lagoons is much higher than effluent flow discharged to groundwater downstream of the holding ponds. The average difference from influent flowmeter to the outfall is between 400,000 - 450,000 gallons per day. Factors for this loss include leakage from the lagoons, seepage from the bottom of unlined holding pond 2, precipitation and evaporation. However, the main reason these flows differ is due to irrigation, which occurs 3 to 5 months of the year and averages 129 million gallons per year (85% of flow difference). The first lagoon liner (south lagoon) is scheduled for replacement in 2019. The second lagoon liner is scheduled for replacement in 2020. Documentation of these improvements are conditions of the 2019 permit. BOD_5 reduction is 76% and TSS reduction is 79%. However, Total Nitrogen reduction is only 32.39%. There are a couple factors that may be leading the low nitrogen reduction. The first is that many of the aerators are not operating properly and the second is the dumping of septic pumper trucks directly into the lagoons before any treatment and without this nitrogen source being accounted for in the influent data. Aerators are scheduled for replacement in the first lagoon in 2019 and in the second lagoon in 2020. The septic pumper truck dump station is set for use in 2019. These improvements should enhance nitrogen treatment.

Special conditions are discussed in **Section 5.3**. Compliance schedule for these conditions is found in **Section 7**.

2.4 Land Application

An irrigation system provides the permittee with a seasonal discharge option outside the use of the I/P cells. Spray irrigation of effluent from the facility is seasonally applied at a property to the northeast of the holding ponds and IP beds, Latitude: 46.18466 | Longitude: -112.86889 (**Figure 5**). The permittee is required to land apply effluent at agronomics rates in accordance with DEQ review and approval. In general, the permittee is prohibited from applying above agronomic rates that may lead to an unauthorized infiltration of pollutants to state ground water, and operating in a manner that results in standing wastewater or overland flow.

Total Nitrogen Load Diverted from Groundwater Discharge to Spray Irrigation

	2015	2016	2017	2018
Volume of Wastewater Diverted to Irrigation	133 MG	127 MG	109 MG	147 MG
Total Nitrogen Diverted to Irrigation	21,100 lbs	18,000 lbs	20,200 lbs	12,750 lbs

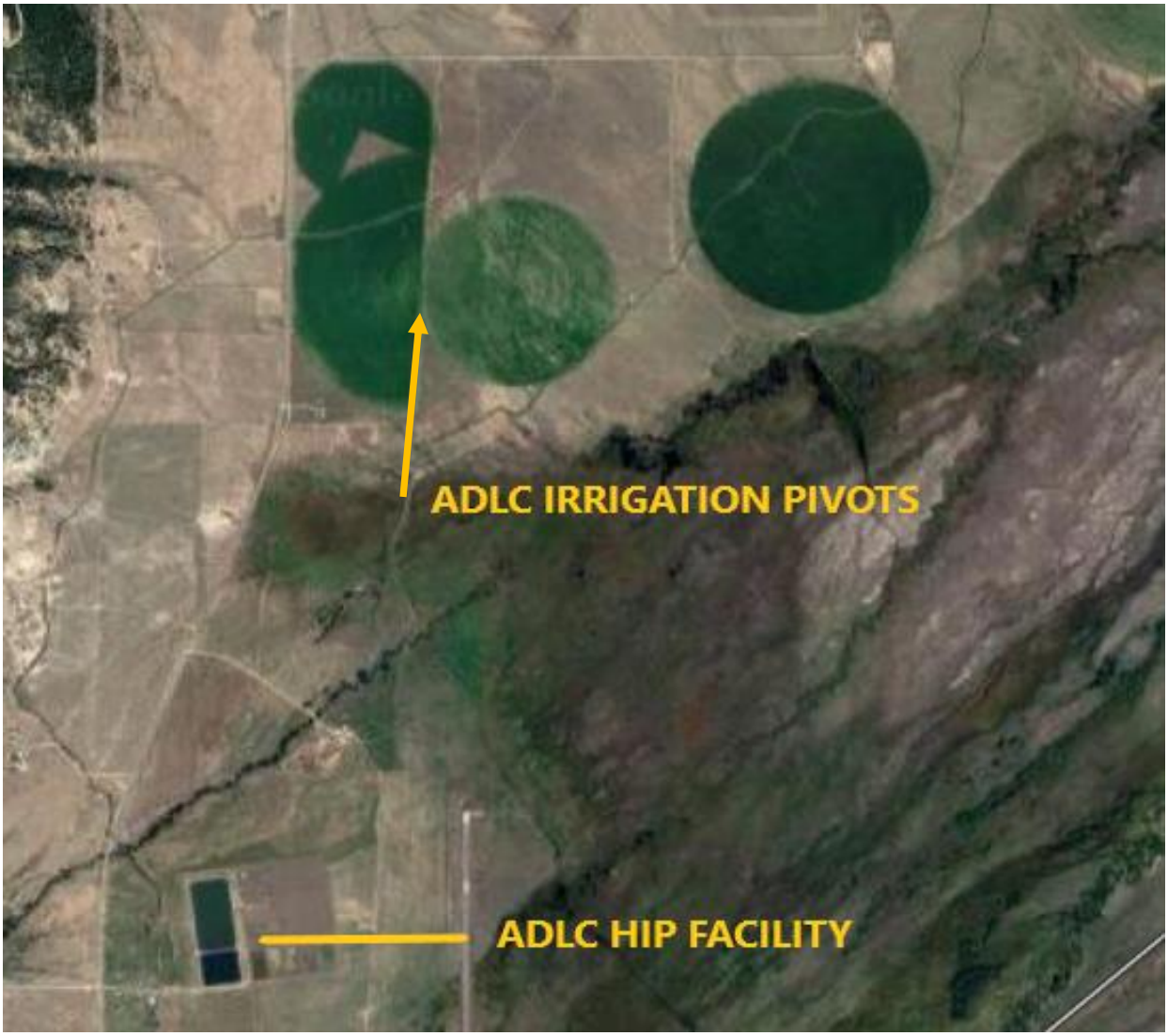


Figure 5. Anaconda – Deer Lodge County Land Application Facility

2.5 GEOLOGY

The United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Soil Survey indicates four soil types present in the area of the facility, (soils map available in **Appendix A**):

1. Sixbeacon gravelly loam, 0 to 4 percent slopes, moderately impacted **(737B**);
2. Sixbeacon cobbly loam, 0 to 4 percent slopes, moderately impacted (**937B**);
3. Saypo loam, 0 to 4 percent slopes, moderately impacted **(945B);**
4. Gregson fine sandy loam, 0 to 4 percent slopes, moderately impacted **(509B)** (USDA, 2018).

Soils described by the NRCS as moderately impacted are those soils that, in general, have good ground coverage but where the plant species present are those species that are tolerant of the impacts of surface mining and/or smelting activities (USDA, 2018). The Sixbeacon gravelly loam, an alluvial fan or stream terrace derived from calcareous gravelly alluvium parent material, is a gravelly loam that grades into extremely gravelly loamy sand with depth. The Sixbeacon cobbly loam forms alluvial fans or stream terraces from calcareous gravelly alluvium parent material and grades into extremely gravelly loamy sand with depth. The Saypo loam, an alluvial fan or stream terrace derived from calcareous fine-loamy alluvium parent material, is a loam that grades into gravelly clay loam with depth. The Gregson fine sandy loam forms stream terraces from fine-loamy alluvium over sandy and gravelly alluvium parent material and grades into very gravelly loamy sand with depth.

Based on an evaluation of the NRCS data, the Sixbeacon gravelly loam soil type is present in the area of the IP beds and mixing zone while both the Sixbeacon cobbly loam and the Sixbeacon gravelly loam soil types are present in the area of the second holding pond (**Appendix A**). The Saypo loam and Gregson fine sandy loam soil types are found beyond the area of the mixing zone east of and downgradient from the discharge from facility. The NRCS data correlates very well with the well logs reported in GWIC for the monitoring wells installed onsite. Monitoring well logs are found in **Appendix B**.

2.6 HYDROGEOLOGY

The facility is located on the western side of the Deer Lodge Valley, a north-south trending Tertiary half-graben drained by the Clark Fork River and its tributaries. The facility is bounded by the Flint Creek Range to the west and the Clark Fork River floodplain to the east. This area of the upper Clark Fork River drainage is floored with thick Quaternary alluvium and glacial deposits as well as unconsolidated Tertiary deposits.

The primary aquifer in the Deer Lodge Valley is a shallow, unconfined aquifer comprised of mostly unconsolidated valley fill. Most of the wells range from a few feet deep to 250 feet. The valley fill, with a maximum thickness of 5,500 feet, is formed from the erosion of the surrounding mountains with a smaller component of volcanic ejecta. These valley fill sediments are of Tertiary age and are overlain by Quaternary alluvial flood plain, fan, and glacial outwash deposits. In the vicinity of the facility, these Quaternary deposits reach a depth of up to 100 feet at the heads of the Lost Creek and Warm Springs Creek fans.

The facility's holding ponds and IP beds are constructed in Quaternary unconsolidated alluvium and glacial deposits. The current depth to shallow ground water near the facility, as measured in monitoring wells MW-1B, MW-5, and MW-6, ranges from 20 to 70 feet. Average groundwater depth in the area is 32 feet.

The hydraulic conductivity (K) of the aquifer underlying the facility, based on a 24-hour pump test of the aquifer conducted on-site, was determined as 165 ft/day (Spratt & Associates, 1990).

The hydraulic gradient (I) and ground water flow direction of the aquifer underlying the facility were determined using static water level measurements from three on-site monitoring wells (MW-1B, MW-5, and MW-6). The hydraulic gradient (I) ranges from 0.0045 to 0.007 ft/ft with a ground water flow direction that ranges from N30°E to N55°E (Anaconda-Deer Lodge County, 2018; DOWL HKM, 2018). DEQ will use the most conservative of these reported values, N30°E, in the evaluation of the potential impact of the discharge from the facility on the underlying aquifer and the potential impact on the nearest downgradient surface water (Lost Creek, 2000 feet).

Important hydrogeologic characteristics are summarized below in **Table 4**.

Table 4. Hydrogeologic Summary	
Average depth to ground water	32 feet (5-year avg. of MW-5 & 6)
General ground water flow direction	N30°E
Hydraulic conductivity	165 feet per day
Hydraulic gradient	0.0045 feet/feet
Nearest downgradient surface water	Lost Creek (2,000 feet)

2.7 GROUND WATER MONITORING WELLS

There are 3 monitoring wells associated with this permit: MW-1B, MW-5 and MW-6. These wells are plotted on **Figure 3**. Monitoring well construction details are provided below in **Table 5**. MW-1B is upgradient of the outfall and represents ambient ground water quality. MW-5 and MW-6 are both downgradient of the outfall and measure ground water quality after the mixing zone downstream of the Infiltration / Percolation Beds. Changes in water quality from these two wells may indicate contamination to ground water from the discharge of this wastewater system. Driller's logs for each monitoring well are attached as **Appendix B**.

Table 5. Monitoring Well Summary
Monitoring Well: MW-1B
MBMG GWIC #: 269838
Status: Constructed on December 10, 2012
Location: Junction of Galen Road and Lost Creek Road Latitude: 46.15689° Longitude: -112.89131°
Representation: Ambient quality of the receiving ground water, upgradient of Outfall 001.
Monitoring Well: MW-5
MBMG GWIC #: 269839
Status: Constructed on December 10, 2012
Location: Located 300-feet northeast of I/P beds Latitude: 46.16015° Longitude: -112.87786°
Representation: Downgradient groundwater post mixing zone
Monitoring Well: MW-6
MBMG GWIC #: 269840
Status: Constructed on December 11, 2012
Location: Located 500-feet north of I/P beds Latitude: 46.16197° Longitude: -112.88163°
Representation: Downgradient groundwater post mixing zone

If a DEQ-approved monitoring well is abandoned, destroyed or decommissioned, or is no longer able to be sampled due to fluctuations in the ground water table, the permittee must install or designate a new well to replace the abandoned, destroyed, decommissioned, or non-viable well.

2.8 GROUND WATER QUALITY CHARACTERISTICS

Water sampling results from MW-1B are provided below in **Table 6**. Based on the 303 microsiemens per centimeter (µS/cm) specific conductance, the receiving water is Class I ground water.

There are two monitoring wells that measure groundwater downgradient of the outfall and mixing zone: MW-5 and MW-6. Water sampling results from MW-5 are provided below in **Table 7.** Water sampling results from MW-6 are provided in **Table 8**.

Table 6. Background (Receiving) Groundwater Monitoring Results – MW-1B

Parameter	Units	Reported DMR values			# of Samples
		Minimum	Maximum	Average	
Chloride (as Cl)	mg/L	0.55	3.14	1.05	7
Escherichia coli bacteria	CFU/100mL	ND	ND	ND	7
Nitrogen, nitrate + nitrite (as N)	mg/L	0.04	0.375	0.126	7
Nitrogen, total Kjeldahl (as N)	mg/L	0.095	1.36	0.392	7
pH	Standard units	7.3	7.9	7.6	7
Specific conductivity (@25°C)	µS/cm	277	325	303	7
Static water level	Feet bgs	21.95	43.06	32.5	7
Sulfate, total	mg/L	7.2	10	8.15	7
Total dissolved solids	mg/L	277	325	303	7

Footnotes: ND – Not Detected; bgs – below ground surface; CFU – Colony Forming Units
Source of data: 2018 permit application & DMR values

Total nitrogen may be calculated as the sum of nitrate + nitrite (0.126 mg/L) and total Kjeldahl nitrogen (0.392 mg/L). The calculated **total nitrogen concentration** in the receiving water is .**518 mg/L**.

Table 7. Groundwater Monitoring Results – MW-5

Parameter	Units	Reported DMR values			# of Samples
		Minimum	Maximum	Average	
Chloride (as Cl)	mg/L	3.09	26.6	16.4	17
Escherichia coli bacteria	CFU/100mL	ND	ND	ND	17
Nitrogen, nitrate + nitrite (as N)	mg/L	0.694	12.6	4.67	17
Nitrogen, total Kjeldahl (as N)	mg/L	0.037	1.11	0.24	17
Phosphorus	mg/L	0.006	0.066	0.018	17
Specific conductivity (@25°C)	µS/cm	411	627	534	17
Static water level	Feet bgs	19.4	28.5	24.1	17

Footnotes: ND – not detected; bgs – below ground surface; CFU – colony forming units

Source of Data: DMR June 2014 - June 2018

Table 8. Groundwater Monitoring Results – MW-6

Parameter	Units	Reported DMR values			# of Samples
		Minimum	Maximum	Average	
Chloride (as Cl)	mg/L	5.26	19.1	10.6	17
Escherichia coli bacteria	CFU/100mL	ND	ND	ND	17
Nitrogen, nitrate + nitrite (as N)	mg/L	2.47	7.49	4.40	17
Nitrogen, total Kjeldahl (as N)	mg/L	0.062	1.46	0.23	17
Phosphorus	mg/L	0.009	0.053	0.022	17
Specific conductivity (@25°C)	µS/cm	428	573	487	17
Static water level	Feet bgs	28.9	41.7	36.4	17

Footnotes: ND – not detected; bgs – below ground surface; CFU – colony forming units

Source of Data: DMR June 2014 - June 2018

3.0 WATER QUALITY STANDARDS AND NONDEGRADATION

Ground water is a water of the state. The State of Montana uses several water quality measures to protect, sustain, and improve the quality of state waters. These water quality limitations provide the basis for effluent limits that DEQ applies to discharge permits (**Section 5**). DEQ protects all designated uses of state water by basing effluent limits on the most restrictive water quality limitations, intended to protect the most sensitive uses.

3.1 BENEFICIAL USES

With a specific conductivity of 303 µS/cm (**Table 6**), the receiving water is Class I ground water and therefore a high-quality water of the State. Class I ground waters must be maintained suitable for the following uses with little or no treatment:

- Public and private drinking water supplies
- Culinary and food processing purposes
- Irrigation
- Drinking water for livestock and wildlife
- Commercial and industrial purposes

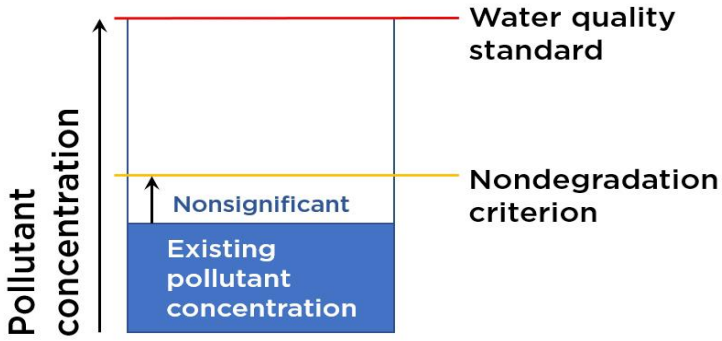
DEQ protects all the assigned beneficial uses by protecting the most sensitive. Drinking water is the most sensitive use of this receiving water.

3.2 WATER QUALITY STANDARDS

DEQ's ground water standard for nitrate is 10.0 mg/L, as is the standard for nitrate + nitrite (as nitrogen). Class I ground water must be maintained suitable for use as a drinking water supply with little or no treatment, and therefore must meet the corresponding human health standard of 10.0 mg/L total nitrogen. These water quality standards may not be exceeded outside a designated mixing zone (**Section 4**).

3.3 NONDEGRADATION

Montana's nondegradation policy is intended to preserve high-quality state waters. Any water whose existing condition is better than the water quality standards must be maintained in that high quality. Nondegradation policy states that certain types of common activities cause nonsignificant changes in water quality, and provides criteria for determining whether changes in water quality are significant.



Nonsignificant changes do not require further nondegradation review. Therefore, DEQ must determine whether the proposed discharge will result in significant changes in water quality.

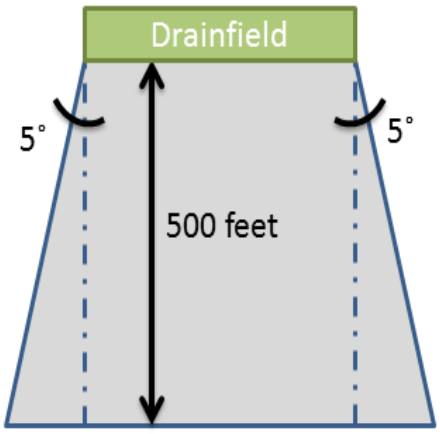
3.4 NONSIGNIFICANCE

DEQ has determined that the activity is not considered to be a new or increased source resulting in a change of existing water quality occurring on or after April 29, 1993. DEQ is therefore not required to perform a significance determination. The applicable water quality standards for Class I ground water are summarized in Table 10. This permit includes monitoring, reporting, and corrective action requirements to establish, confirm, and maintain compliance with permit limitations.

4.0 MIXING ZONE

A mixing zone is a specifically defined area of the receiving water where water quality standards may be exceeded. DEQ evaluates the suitability according to criteria established in the Administrative Rules of Montana. The mixing zone is then defined in the permit. The applicant requested a standard mixing zone for this discharge, consistent with previous permit cycles.

A standard mixing zone extends 500 feet downgradient from the source. The upgradient boundary is equal to the width of the source (measured perpendicular to the of ground water flow direction). The mixing zone widens in the downgradient direction by 5° on either side. The width of the downgradient boundary is calculated by adding the increased width for each side (the tangent of 5° (0.0875) times the mixing zone length) to the width of the upgradient boundary. Standard mixing zones extend 15 feet below the ground water table.



The volume of ground water (Q_{GW}) available to mix with the effluent is calculated using Darcy's Equation: $Q_{GW} = KIA$

Where:
Q_{GW} = ground water flow volume (feet^3/day) =17,686 ft^3/day
K = hydraulic conductivity (feet/day) = 165 ft/d
I = hydraulic gradient (feet/feet) = 0.0045 ft/ft
A = cross-sectional area (feet^2) at the downgradient boundary of the mixing zone= 23,820

Table 9 summarizes the variables used in Darcy's equation and the resulting volume of ground water available to mix at Outfall 001. These values are drawn from the previous fact sheet.

Table 9. Hydrogeologic and Mixing Zone Information - Outfall 001

Parameter	Units	Value
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	0.126
Ground Water Flow Direction	azimuth/bearing	N30°E
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	1500
Width of Mixing Zone at Down Gradient Boundary	feet	1587.5
Cross Sectional Area of Mixing Zone (A)	ft^2	23,820
Hydraulic Conductivity (K)	feet/day	165
Hydraulic Gradient (I)	ft/ft	0.0045
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	17,686

In order to determine whether a mixing zone is allowable, DEQ calculates a predicted concentration at the downgradient end of the mixing zone. This mixing calculation follows the following procedure:

- Volume of ground water times the concentration of the parameter = existing load;
- Volume of discharge times the concentration of the parameter = waste load; and
- (Existing load + waste load) / total volume = predicted concentration.

Because the predicted concentration must satisfy the most stringent nonsignificance criterion (**Section 3**), DEQ can calculate water quality based effluent limits (WQBELs) by rearranging the equation and solving for the effluent concentration (**Section 5**).

5.0 PERMIT CONDITIONS

Discharge permits include conditions that ensure compliance with the Montana Water Quality Act and the regulations used to implement it. These conditions include effluent limits as well as any special conditions that DEQ deems necessary to protect the quality of the receiving water.

Montana's numeric water quality standards are published in Circular DEQ-7. Water quality criteria applicable to this permit are summarized below in **Table 10**. The permit establishes effluent limits that will meet water quality standards and nondegradation criteria, thereby protecting beneficial uses and existing high-quality waters. The most restrictive criteria in **Table 10** provide the basis for the effluent limits.

Table 10. Applicable Ground Water Quality Criteria

Parameter	Human Health Standard	Beneficial Use Support
Nitrate + nitrite as Nitrogen [N]	10 mg/L	-
Total Nitrogen	-	10 mg/L

This discharge permit includes numeric WQBELs that restrict the strength and volume of the discharge. DEQ calculates WQBELs by rearranging the mixing zone equation (**Section 4**) and solving for the effluent concentration that satisfies the water quality criteria. DEQ evaluates and recalculates the limits using updated water quality data as part of every permit renewal cycle. In this way, DEQ protects the receiving water quality by continually assessing cumulative impacts to the receiving water.

DEQ calculated the effluent limits using the same method as for the previous permit. DEQ uses updated ambient ground water quality data to re-evaluate the receiving water quality and the assimilative capacity for dilution.

5.1 TOTAL NITROGEN EFFLUENT LIMIT

The allowable discharge concentration is derived from a mass balance equation that considers the available dilution volume and the background concentration of the receiving water. As described in Table 9 above, the volume of receiving water available to mix with effluent ($\mathbf{Q}_{GW}$) is 17,686 ft^3/day (or 132,291 gpd) as determined using Darcy's equation. $\mathbf{Q}_{GW}$ (in gpd) is used in the mass balance equation (ARM 17.30.517(1)(d)(vi-vii)) to determine the applicable WQBEL for TN. The mass balance equation has been rearranged to the following form to determine the allowable discharge load such that the applicable ground water standard is not exceeded:

$$L_{EFF} = [C_{STD} (Q_{GW} + Q_{EFF})]X - C_{AMB}Q_{GW}X$$

Where:

L_{EFF} = daily maximum load (lbs./day)
C_{STD} = most stringent applicable ground water quality standard (mg/L)
C_{AMB} = ambient ground water concentration (mg/L) of Nitrate + Nitrite (as N)
Q_{GW} = ground water volume (gpd) available for mixing at the end of the mixing zone
Q_{EFF} = volume of effluent (gpd)
X = 8.34×10^{-6}, the conversion factor that converts concentration (mg/L) and flow (gpd) into load (lbs./day)

Using the values provided above, the result for L_{EFF} is **219 lbs./day**. This is the final WQBEL expressed as a load limit. Load limits are appropriate for discharges to ground water since the long-term loading is the greater concern in absence of aquatic life considerations. Additionally, load limits inherently control both the strength and volume of the discharge. The limit calculations are provided in detail in **Appendix C**.

Based on the information and analyses presented above, DEQ proposes the following numerical effluent limitations in **Table 11** below.

Table 11: Effluent Limit - Outfall 001

Parameter	Units	Monthly Average(1)
Total Nitrogen (as N)	lbs/day	219

Footnotes:

(1) See definition in Part V of permit.

5.3 SPECIAL CONDITIONS

Planned improvements for 2019 and 2020 were discussed during a DEQ site visit October 2018 and appear in the 2017 Anaconda – Deer Lodge County Wastewater Facility Plan PER. This permit requires documentation of improvements after they are complete. The following special conditions will be included in the permit:

- Document construction to make septic pumper truck dump station operational
- Document replacement of aerators & liner in first lagoon (south lagoon)
- Document replacement of aerators & liner in second lagoon (north lagoon)
- Begin monthly monitoring for MW-5 and MW-6
- Begin quarterly monitoring for MW-1B

Conditions of this permit and compliance schedule are listed in **Section 7**.

6.0 MONITORING AND REPORTING REQUIREMENTS

DEQ requires influent, effluent and ground water monitoring to assure compliance with the effluent limitations and therefore water quality standards. Influent monitoring, effluent monitoring and ground water monitoring is required as a condition of this permit. All monitoring and sampling required by this permit must be representative; therefore, the permit identifies specific monitoring locations. Monitoring requirements and rationale are summarized below.

6.1 INFLUENT MONITORING

The permittee collected and reported influent samples and flow measurements throughout the permit cycle.

Influent sampling must be conducted that is representative of the volume and nature of the wastewater entering the facility. The influent monitoring location is the influent sampling manhole (**Figure 2**). The influent flow measuring device (FM-001) is in the headworks building before discharge to the lagoons. Parameter analytical methods must be in accordance with the Code of Federal Regulations (CFR) Title 40 Part 136 unless otherwise specified. Influent monitoring and reporting requirements are summarized in **Table 12** below.

Table 12: Influent Monitoring and Reporting Requirements

Parameter	Monitoring Location(s)	Units	Sample Type(1)	Minimum Sampling Frequency	Reporting Requirements(1)(2)	Reporting Frequency	Rationale
Flow Rate	Influent Flow Meter	gpd	Continuous	Continuous	Daily Maximum and Monthly Average	Monthly	Influent Characterization
BOD_5	Influent sampling manhole	mg/L	Composite	1/Month	Monthly Average	Monthly	Influent Characterization
TSS	Influent sampling manhole	mg/L	Composite	1/Month	Monthly Average	Monthly	Influent Characterization
Nitrate + Nitrite (as N)	Influent sampling manhole	mg/L	Composite	1/Month	Monthly Average	Monthly	Influent Characterization
Total Kjeldahl Nitrogen (as N)	Influent sampling manhole	mg/L	Composite	1/Month	Monthly Average	Monthly	Influent Characterization
Total Nitrogen (as N)(3)	Influent sampling manhole	mg/L lbs/day(4)	Calculated	1/Month	Monthly Average	Monthly	Influent Characterization

Footnotes:

(1) See definitions in Part V of the permit.

(2) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.

(3) Total Nitrogen is the sum of the Nitrate + Nitrite and Total Kjeldahl Nitrogen parameters.

(4) Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

6.2 EFFLUENT MONITORING

This permit includes numeric effluent limitations with specific magnitudes and durations to ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see **Section 3**).

Accordingly, the permittee is required to monitor and report at a specified frequency to demonstrate compliance with these limitations.

Effluent samples and discharge flow measurements must be representative of the nature and volume of the effluent. The effluent sample location (EFF-001) is located at the manhole east of the lagoons (**Figure 2)**. The permittee is required to maintain and report flow measurements using a flow-measuring device capable of measurements that are within 10 percent of the actual flow. The discharge flow meter (FM-002) is located after the lagoons and holding ponds prior to discharge into the I/P beds (**Figure 4**). Effluent monitoring and reporting requirements are summarized in **Table 13** below.

Table 13: Effluent Monitoring and Reporting Requirements - Outfall 001

Parameter	Monitoring Location(s)	Units	Sample Type(1)	Minimum Sampling Frequency	Reporting Requirements(1)(2)	Reporting Frequency
Flow Rate(3)	EFF- Flow Meter	gpd	Continuous	Continuous	Daily Maximum and Monthly Average	Monthly
BOD_5	EFF-Manhole	mg/L	Composite	1/Month	Monthly Average	Monthly
TSS	EFF-Manhole	mg/L	Composite	1/Month	Monthly Average	Monthly
Oil & Grease(4)	EFF-Manhole	mg/L	Grab	1/Month	Daily Maximum and Monthly Average	Monthly
Nitrate + Nitrite (as N)	EFF-Manhole	mg/L	Composite	1/Month	Daily Maximum and Monthly Average	Monthly
Total Ammonia (as N)	EFF-Manhole	mg/L	Composite	1/Month	Daily Maximum and Monthly Average	Monthly
Total Kjeldahl Nitrogen (as N)	EFF-Manhole	mg/L	Composite	1/Month	Daily Maximum and Monthly Average	Monthly
Total Nitrogen (as N)(5)	EFF-Manhole	mg/L lbs/day(6)	Calculated	1/Month	Daily Maximum and Monthly Average	Monthly
Total Phosphorus (as P)	EFF-Manhole	mg/L	Composite	1/Month	Monthly Average	Monthly
Land Application						
Duration of Application		days/ month	Continuous	Continuous	Total Number of Application Days	Monthly
Flow rate, Effluent	Irrigation Flow Meter	gal/month	Continuous	Continuous	Monthly Average	Monthly
		gal/day	Calculated		Monthly Average	Monthly

Footnotes:

(1) See definitions in Part V of the permit.

(2) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.

(3) If no discharge occurs during the reporting period, "No Discharge" shall be recorded on the DMR report form.

(4) Hexane extraction method.

(5) Total Nitrogen is the sum of the Nitrate + Nitrite and Total Kjeldahl Nitrogen parameters.

(6) Load calculation: lbs/day = concentration (mg/L) x flow (gal/day) x (8.34×10^{-6}).

6.3 GROUND WATER MONITORING

As a special condition, this permit requires ground water monitoring to provide long term ambient and downgradient characterization of the aquifer. Ground water monitoring will be required at monitoring wells MW-5 and MW-6. Data collected via ground water monitoring will be used for mixing zone evaluation and aquifer characterization in future permit renewals AND FOR COMPLIANCE MONITORING. Sampling and reporting requirements will commence upon the effective date of the permit. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Ground water monitoring and reporting requirements are summarized in **Table 14** below.

Table 14: Ground Water Monitoring and Reporting Requirements: MW-5 and MW-6

Parameter	Monitoring Location	Units	Sample Type(1)	Minimum Sampling Frequency	Reporting Requirements	Reporting Frequency
Chloride (as Cl)	MW-5, MW-6	mg/L	Grab	1/Month	Monthly Average	Monthly
Escherichia coli Bacteria(2)	MW-5, MW-6	CFU/100mL	Grab	1/Month	Daily Maximum and Monthly Average	Monthly
Nitrate + Nitrite (as N)	MW-5, MW-6	mg/L	Grab	1/Month	Monthly Average	Monthly
Total Ammonia (as N)	MW-5, MW-6	mg/L	Grab	1/Month	Monthly Average	Monthly
Total Kjeldahl Nitrogen (as N)	MW-5, MW-6	mg/L	Grab	1/Month	Monthly Average	Monthly
Total Nitrogen (as N)(3)	MW-5, MW-6	mg/L	Calculated	1/Month	Monthly Average	Monthly
Total Phosphorus (as P)	MW-5, MW-6	mg/L	Grab	1/Month	Monthly Average	Monthly
Specific Conductivity @ 25°C	MW-5, MW-6	µS/cm	Grab	1/Month	Monthly Average	Monthly
Static Water Level (SWL)(4)	MW-5, MW-6	Feet bgs	Instantaneous	1/Month	Monthly Average	Monthly

Footnotes:

(1) See definitions in Part V of the permit.

(2) Report the geometric mean if more than one sampling event occurs during a given monitoring period.

(3) Total Nitrogen is the sum of the Nitrate + Nitrite and Total Kjeldahl Nitrogen parameters.

(4) Point of reference for SWL measurements shall be from ground surface and measured to within 1/100th of one foot.

Table 15: Ground Water Monitoring and Reporting Requirements: MW-1B

Parameter	Monitoring Location	Units	Sample Type[1]	Minimum Sampling Frequency	Reporting Requirements	Reporting Frequency
Chloride (as Cl)	MW-1B	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrate + Nitrite (as N)	MW-1B	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Total Ammonia (as N)	MW-1B	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Total Kjeldahl Nitrogen (as N)	MW-1B	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Total Nitrogen (as N)[2]	MW-1B	mg/L	Calculated	1/Quarter	Quarterly Average	Quarterly
Total Phosphorus (as P)	MW-1B	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW-1B	µS/cm	Grab	1/Quarter	Quarterly Average	Quarterly
Static Water Level (SWL)[3]	MW-1B	Feet bgs	Instantaneous	1/Quarter	Quarterly Average	Quarterly

Footnotes:

(1) See definitions in Part V of the permit.

(2) Total Nitrogen is the sum of the Nitrate + Nitrite and Total Kjeldahl Nitrogen parameters.

(3) Point of reference for SWL measurements shall be from ground surface and measured to within 1/100th of one foot.

7.0 COMPLIANCE SCHEDULE

The actions listed in **Table 16** below must be completed on or before the respective scheduled completion date. A report documenting each respective action must be received by DEQ on or before the scheduled reporting date. The reports documenting the installation of the aerators, liners, and septic pumper truck dump station must include the installation location, engineering drawings, line diagrams, and/or any other pertinent materials of documentation. Completion of all actions or deliverables must be reported to DEQ in accordance with Part II.D and Part IV.G of the permit.

Table 16: Compliance Schedule

Action	Frequency	Scheduled Completion Date of Action(1)	Report Due Date(2)
Document replacement of aerators & liner in first lagoon (south lagoon)	Single Event	By December 31, 2019	Due on or before January 31, 2020
Document replacement of aerators & liner in second lagoon (north lagoon)	Single Event	By December 31, 2020	Due on or before January 31, 2021
Document construction to make septic pumper truck dump station operational	Single Event	By December 31, 2019	Due on or before January 31, 2020

Footnotes:
(1) The actions must be completed on or before the scheduled completion dates.
(2) The report must be received by DEQ on or before the scheduled report due date and must include all information as required.

8.0 PUBLIC NOTICE

Legal notice information for water quality discharge permits are listed at the following website: http://deq.mt.gov/Public/notices/wqnotices. Public comments on this proposal are invited any time prior to close of business on **March 27, 2019**. Comments may be directed to:

DEQWPBPublicComments@mt.gov

or to:

Montana Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments pertinent to this permitting action and may issue a final decision within thirty days of the close of the public comment period.

All persons, including the applicant, who believe any condition of the draft permit is inappropriate, or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). All public comments received for this draft permit will be included in the administrative record and will be available for public viewing during normal business hours.

Copies of the public notice are mailed to the applicant, state and federal agencies, and interested persons who have expressed interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this draft permit. Electronic copies of the public notice, draft permit, fact sheet, and draft environmental assessment are available at the following website: http://deq.mt.gov/Public/notices/wqnotices.

Any person interested in being placed on the mailing list for information regarding this permit may contact the DEQ Water Protection Bureau at (406) 444-5546 or email DEQWPBPublicComments@mt.gov. All inquiries will need to reference the permit number (MTX000231), and include the following information: name, address, and phone number.

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing.

9.0 REFERENCES

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Administrative Rules of Montana, Title 17, Chapter 30, Water Quality:

- Subchapter 2 - Water Quality Permit Fees.
- Subchapter 5 – Mixing Zones in Surface and Ground Water.
- Subchapter 7 – Nondegradation of Water Quality.
- Subchapter 10 – Montana Ground Water Pollution Control System.
- Subchapter 13 – Montana Pollutant Discharge Elimination System.

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Department of Environmental Quality, Water Quality Circulars:

- Circular DEQ-2 – Design Standards for Wastewater Facilities.
- Circular DEQ-4 – Montana Standards for On-Site Subsurface Sewage Treatment Systems.
- Circular DEQ-7 – Montana Numeric Water Quality Standards, Required Reporting Values, and Trigger Values.

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APPENDIX A – SOIL SURVEY MAP – ANACONDA HIP FACILITY

Anaconda – Deer Lodge County, Holding Ponds and Infiltration / Percolation Beds Wastewater Facility

Source: USDA – NRCS, Web Soil Survey: https://websoilsurvey.nrcs.usda.gov/app/

Section 2.5 describes the area soil survey in detail.

APPENDIX B – MONITORING WELL SUMMARY

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (1/29/2013 1:23:01 PM)

Site Name: ANACONDA DEER LODGE COUNTY * MW-1B
GWIC Id: 269838

Section 1: Well Owner(s)
1) ANACONDA DEER LODGE COUNTY (MAIL)
800 S. MAIN
ANACONDA MT 59711 [01/23/2013]

Section 2: Location

Township	Range	Section	Quarter Sections
05N	10W	30	SE¼ NE¼ NE¼ SE¼

County	Geocode
DEER LODGE	

Latitude	Longitude	Geomethod	Datum
46.156791958333	-112.891041527778	SUR-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Section 3: Proposed Use of Water
MONITORING (1)

Section 4: Type of Work
Drilling Method: AIR ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Monday, December 10, 2012

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	98	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-1.9	3	8				STEEL
-1.72	57	4				PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
57	97	4		0.06	SCREEN-CONTINUOUS-PVC

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	53	3/8 BENTONITE CHIPS	
53	98	6/9 COLORADO SILICA SAND	

Section 7: Well Test Data

Total Depth: 97
Static Water Level: 69.16
Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	3	(ML) SILT WITH VERY FINE SAND AND CLAY, LIGHT GRAY, DRY
3	38	(SM) SILTY SAND AND FINE GRAVEL, TRACE COURSE GRAVEL, SUBROUNDED, LIGHT GRAY, DRY
38	81	(SM) SILTY SAND AND FINE GRAVEL, INCREASE GRAVEL WITH INCREASING DEPTH, SUBROUNDED, LIGHT BROWN, MOIST
81	98	(GM) FINE TO MEDIUM GRAVEL WITH FINES, SUBROUNDED, LIGHT BROWN, WET

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company:OKEEFE DRILLING CO
License No:-
Date Completed:12/10/2012

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (1/29/2013 1:24:48 PM)

Site Name: ANACONDA DEERLODGE COUNTY * MW-5
GWIC Id: 269839

Section 1: Well Owner(s)

1) ANACONDA DEERLODGE COUNTY (MAIL)
800 S. MAIN
ANACONDA MT 59711 [01/23/2013]

Section 2: Location

Township	Range	Section	Quarter Sections
05N	10W	29	SW¼ SE¼ NE¼ NW¼

County	Geocode
DEER LODGE	

Latitude	Longitude	Geomethod	Datum
46.160434397222	-112.877494608333	SUR-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: AIR ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Monday, December 10, 2012

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	57	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2.1	2.6	8				STEEL
-1.53	6.5	4				PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
6.5	56.5	4		0.06	SCREEN-CONTINUOUS-PVC

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	4	3/8 BENONTITE CHIPS	
4	57	6/9 COLORADO SILICA SAND	

Section 7: Well Test Data

Total Depth: 56.5
Static Water Level: 21.82
Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	2	(ML) SILT WITH VERY FINE SAND AND CLAY, LIGHT GRAY,DRY
2	32	(GM) FINE GRAVEL WITH SAND AND SILT, SUBROUNDED, LIGHT GRAY, DRY,MOISTURE AT 20 FEET AND COLOR CHANGE TO LIGHT BROWN
32	46	(GM) MEDIUM TO COURSE GRAVEL WITH FINES, SUBROUNDED, LIGHT BROWN, MOIST TO WET
46	49	(SM) SILTY SAND WITH TRACE GRAVEL, LIGHT BROWN TO WET
49	57	(GM) MEDIUM TO COURSE GRAVEL WITH FINES, SUB ROUNDED, LIGHT BROWN, WET

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company:OKEEFE DRILLING CO
License No:-
Date Completed:12/10/2012

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
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View scanned well log (1/29/2013 1:26:29 PM)

Site Name: ANACONDA DEERLODGE COUNTY * MW-6
GWIC Id: 269840

Section 1: Well Owner(s)

1) ANACONDA DEERLODGE COUNTY (MAIL)
800 S. MAIN
MT ANACONDA 59711 [01/23/2013]

Section 2: Location

Township	Range	Section	Quarter Sections
05N	10W	29	NE¼ NW¼ SW¼ NE¼

County	Geocode
DEER LODGE	

Latitude	Longitude	Geomethod	Datum
46.161948930556	-112.881518055556	SUR-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: AIR ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Tuesday, December 11, 2012

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	57	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-1.8	3	8				STEEL
-1.55	16.5	4				PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
16.5	56.5	4		0.06	SCREEN-CONTINUOUS-PVC

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	13	3/8 BENTONITE CHIPS	
13	57	6/9 COLORADO SILICA SAND	

Section 7: Well Test Data

Total Depth: 56.5
Static Water Level: 34.9
Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	2.5	(ML) SILT WITH VERY FINE SAND AND CLAY, LIGHT BROWN, DRY
2.5	41	(GM) FINE GRAVEL WITH SAND SILT, AND SCATTERED COBBLES, SUBROUNDED, LIGHT,GRAY, DRY, MOISTURE AT 32 FEET, COLOR CHANGE TO LIGHT BROWN, WET BELOW 37 FEET
41	47	(SM) MEDIUM TO COURSE SAND WITH SCATTERED WELL ROUNDED SMALL GRAVEL, LIGHT BROWN, WET
47	57	(GM) MEDIUM TO COURSE GRAVEL WITH FINES AND TRACE COBBLES, SUBROUNDED, LIGHT BROWN, WET

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: OKEEFE DRILLING CO
License No: -
Date Completed: 12/11/2012

APPENDIX C – EFFLUENT LIMIT CALCULATIONS

The volume of ground water ($\mathbf{Q}_{GW}$) available to mix with the effluent is based on the dimensions of the mixing zone and calculated using Darcy's Equation (ARM 17.30.517(1)(d)(i)):

$$\mathbf{Q}_{GW} = \mathbf{KIA} \text{ (}\textit{Equation 1}\text{)}$$

Where:

$\mathbf{Q}_{GW}$ = ground water flow volume (ft^3/day)
K = hydraulic conductivity (ft/day)
I = hydraulic gradient (ft/ft)
A = cross-sectional area (ft^2) of flow at the downgradient boundary of the mixing zone

Substituting the values for each parameter from Table 9 above into Equation 1, the resulting value for $\mathbf{Q}_{GW}$ is:

$$\mathbf{Q}_{GW} = (165 \text{ ft/day})(0.0045 \text{ ft/ft})(23{,}820 \text{ ft}^2)$$
$$\mathbf{Q}_{GW} = 17{,}686 \text{ ft}^3\text{/day}$$

Based on the description of the proposed mixing zone above and analysis presented in Section 4, DEQ has determined, pursuant to ARM 17.30.505, that a standard mixing zone is applicable for Outfall 001 and is authorized for nitrate. The permittee did not request a mixing zone for any additional parameters. Therefore, DEQ does not authorize a mixing zone for any other effluent parameters; the most stringent ground water standards for all other effluent parameters are applicable to the discharge at the end of control.

1. Water Quality-Based Effluent Limits (WQBELs)

ARM 17.30.1006 sets forth the basis for developing effluent limits based on water quality. The water quality standards in ARM 17.30.1006 state that nitrate concentrations in ground water at the end of the mixing zone shall not exceed the applicable numeric standard of 10.0 mg/L. A mass-balance approach is used to calculate the effluent quality of the discharge that meets the water quality standards.

The nitrogen found in raw wastewater is primarily in the form of organic matter and ammonia. After primary treatment, the nitrogen in wastewater is primarily 85% ammonia; after discharge into the drainfield, ammonia is almost entirely converted to nitrite, and ultimately to nitrate (EPA, 2002). For the purposes of predicting the Nitrate + Nitrite (as N) concentration in the ground water at the end of mixing zone, DEQ assumes that the entire nitrogen load in the treated wastewater is converted into and enters the ground water as nitrate. DEQ will limit Total Nitrogen (TN) in this permit.

The allowable discharge concentration is derived from a mass balance equation that considers the available dilution volume and the background concentration of the receiving water. As described in Section 4, the volume of receiving water available to mix with effluent ($\mathbf{Q}_{GW}$) is 17,686 ft^3/day (or 132,291 gpd) as determined using Darcy's equation. $\mathbf{Q}_{GW}$ (in gpd) is used in the mass balance equation (ARM 17.30.517(1)(d)(vi-vii)) to determine the applicable WQBEL for TN. The mass balance equation has been

rearranged to the following form to determine the allowable discharge load such that the applicable ground water standard is not exceeded:

$$\boldsymbol{L}_{EFF} = [\boldsymbol{C}_{STD}(\boldsymbol{Q}_{GW} + \boldsymbol{Q}_{EFF})]\boldsymbol{X} - \boldsymbol{C}_{AMB}\boldsymbol{Q}_{GW}\boldsymbol{X} \quad \textit{(Equation 2)}$$

Where:

$\boldsymbol{L}_{EFF}$ = daily maximum load (lbs/day)
$\boldsymbol{C}_{STD}$ = most stringent applicable ground water quality standard (mg/L)
$\boldsymbol{C}_{AMB}$ = ambient ground water concentration (mg/L) of Nitrate + Nitrite (as N)
$\boldsymbol{Q}_{GW}$ = ground water volume (gpd) available for mixing at the end of the mixing zone $\boldsymbol{Q}_{EFF}$ = volume of effluent (gpd)
$\boldsymbol{X}$ = 8.34×10^{-6}, the conversion factor that converts concentration (mg/L) and flow (gpd) into load (lbs/day)

As indicated by Table 10, the most stringent applicable ground water quality standard ($\boldsymbol{C}_{STD}$) for Nitrate + Nitrite (as N) is 10.0 mg/L. The ambient concentration of Nitrate + Nitrite (as N) in the receiving water ($\mathbf{C}_{AMB}$) is 0.126 mg/L as reported by the permittee (see Table 6). As described in Section 4, the $\mathbf{Q}_{GW}$ for Outfall 001 is 132,291 gpd (17,686 ft^3/day). Finally, the applicant has reported an average daily discharge flow ($\mathbf{Q}_{EFF}$) based on the design of the system of up to 2.5 MGD (2,500,000 gpd). Substituting these values into Equation 2, the resulting value for $\mathbf{L}_{EFF}$ is:

$$\boldsymbol{L}_{EFF} = [\mathbf{10.0}\ \text{mg/L}(\mathbf{132{,}291}\ \text{gpd} + \mathbf{2{,}500{,}000}\ \text{gpd})]\mathbf{8.34x10^{-6}} - (\mathbf{0.126}\ \text{mg/L})(\mathbf{132{,}291}\ \text{gpd})(\mathbf{8.34x10^{-6}})$$

$$\boldsymbol{L}_{EFF} = \mathbf{219}\ \text{lbs/day}$$

Thus, the TN WQBEL is **219 lbs/day** for Outfall 001.

SECOND LAGOON
NEW LINER – 2020
NEW AERATORS – 2020

FIRST LAGOON
NEW LINER – 2019
NEW AERATORS – 2019

SEPTIC PUMPER TRUCK DUMP STATION
OPERATIONAL 2019

DEQ
Montana Department of Environmental Quality

N
W E
S

ANACONDA- DEER LODGE COUNTY WASTEWATER SYSTEM

LAGOONS & HEADWORKS

PLANNED IMPROVEMENTS

Anaconda – Deer Lodge County Wastewater System

Holding Ponds – Infiltration / Percolation Beds

Planned Improvements